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REGULATORY IMPACT STATEMENT:  
PROTEOLYTIC ENZYMES

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U.S. Department of Agriculture  
Washington, D.C. 20250

December 1979

## STAFF REPORT

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REGULATORY IMPACT STATEMENT; PROTEOLYTIC ENZYMES. By Elwin Guild and Clark R. Burbee; National Economics Division; Economics, Statistics, and Cooperatives Service; U.S. Department of Agriculture; Washington, D.C. 20250; December 1979

ABSTRACT

Three regulatory options to authorize the use of proteolytic enzymes to tenderize the meat of livestock, except beef which is already approved, and poultry were assessed. The options are: (1) restricting use to beef, (2) restricting use to beef and the meat of all other mature animals and (3) unrestricted use. The analysis focused on the impact upon the supply of tender meat, prices for mature animals, and extent of use of the tenderizers.

KEYWORDS: Proteolytic enzyme, mature animals, tender meat, supply farm price.

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## REGULATORY IMPACT STATEMENT: PROTEOLYTIC ENZYMES

### INTRODUCTION

Early in 1979, the Food Safety and Quality Service (FSQS) requested the Economics, Statistics, and Cooperatives Service (ESCS) to conduct economic analyses of several proposed regulatory changes. These proposals were intended to change certain provisions of the Meat and Poultry Inspection Acts. Before finalizing rule changes, Executive Order 12044 dated March 23, 1978, directs each agency to adopt procedures to prevent regulations from imposing unnecessary burdens on the economy, individuals, public or private organizations or State or local governments. This requires an analysis to judge the effects of the present regulation, costs and benefits of the proposed changes, and identification and determination of the costs and benefits of any viable alternatives.

Food Safety and Quality Service is the Federal agency responsible for meat and poultry inspection. The service was requested to consider and approve additional uses of meat tenderizers known as proteolytic enzymes to the meat of mature swine and laying hens. The purpose is to improve the palatability and tenderness of the meat of these animals and, therefore, their marketability and value.

This report presents an analysis of the economic impacts of several alternatives for use of meat tenderizers. It is presented in the form generally used for preparation of regulatory impact statements.

\*Economist formerly with FSQS and agricultural economist with National Economics Division, ESCS, USDA.



## DRAFT IMPACT STATEMENT

1. Title: Use of Certain Proteolytic Enzymes in Certain Meat and Poultry Products

2. Nature of Proposed Action and Groups Impacted

This action proposes to amend the Federal meat inspection regulations to permit the use of specified proteolytic enzymes 1/ to tenderize the muscle tissue of all cuts of red meat. Presently the use of these enzymes is only authorized for beef cuts. In addition, it would amend the Federal poultry products inspection regulations to permit the use of these proteolytic enzymes to tenderize the muscle tissue of mature poultry including chicken and turkey.

This proposal limits the moisture gain in the uncooked tissue from the solution containing the approved proteolytic enzymes, to 3 percent above the weight of the untreated tissue. Products cooked after the enzyme treatment are required to return to a maximum weight of no more than that of the untreated product.

This proposal would amend the Federal meat inspection regulations and Federal poultry products inspection regulations to provide the meat and poultry muscle tissue that has been tenderized with a proteolytic enzyme shall bear a labeling statement as to the presence of the enzyme.

3. Purpose and Need For the Action

- a. Purpose

The purpose of this action is to increase consumer acceptance of those red and poultry meats generally regarded as being not tender.

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1/ They include aspergillus oryzae, aspergillus flavus oryzae groups, bromelin, ficin, and papain.



Use of proteolytic enzymes on the muscle tissue of these meats should increase their acceptability by consumers and allow their use in a wider variety of products. With expanded markets, producers of less tender meat animals could realize higher marketing returns.

b. Need

The Department has received requests and petitions for the use of certain proteolytic enzymes to tenderize pork and mature poultry muscle tissues. Proponets contend that the prices for older animals sold for slaughter such as sows, sheep and laying hens are heavily discounted in comparison to prices for traditional classes of slaughter animals (table 1). They contend that the use of proteolytic enzymes would improve the palatability of treated muscle tissue and hence consumer acceptance of meat and poultry products derived therefrom. This could result in higher animal prices to producers, and improved farm income. Consumers would have a greater volume and array of meat and poultry products available in the marketplace.

The Department has either conducted or observed tests that confirm proteolytic enzymes are effective tenderizers of pork and poultry meat tissue. It is presumed that the enzymes would be equally effective on sheep muscle tissue. Taste tests conducted by the Department indicate that enzyme treated tissue from older sows is more palatable than from none treated sows.

4. Options Considered

- a. Deny industry's requests for expansion of the use of proteolytic enzyme tenderizers beyond their approved use for beef cuts.
- b. Approve the use of proteolytic enzyme tenderizers for all red meat and poultry.





Table 1--Comparison of quantities slaughtered and prices paid for young and mature classes of hogs, sheep and poultry, 1976-78 average

Class	Quantity		Price
	Number	Percent	
	(000)		
Hogs			
Barrows and gilts	68,414	93.9	\$44.29 cwt.
Sows	3,775	5.2	38.39 "
Stags and boars	687	0.9	<u>1/</u> "
Sheep			
Lambs and yearlings	5,504	92.9	53.77 "
Sheep	421	7.1	15.90 "
Poultry			
Broilers	3,434,000	94.8	
Farm prices	--	--	24.4 c/lb.
Plant RTC	--	--	40.4 "
Hens, light wt.	158,550	4.4	
Farm price	--	--	10.1 "
Plant RTC price	--	--	28.6 "
Hens, heavy wt.	28,271	0.8	
Farm price	--	--	17.5 "
Plant RTC price	--	--	37.4 "
Turkeys, young	130,459	99.2	36.2
Turkeys, mature	1,020	0.8	<u>1/</u>

1/ Not available.





c. Approve the use of proteolytic enzyme tenderizers for all red meat and mature poultry.

5. USDA and Other Federal Costs

Federal meat and poultry inspectors currently monitor and verify the formulation and moisture control activities of meat and poultry processors in the normal course of their inspection duties. Therefore, no significant increase in in-plant inspection workload or laboratory analysis activity is anticipated.

6. Expected Imapcts

a. Impact on main purpose and need to which action is addressed and duration.

The use of proteolytic enzymes on the meat tissues of the older, generally leaner, lower graded and lower priced red meat and poultry animals (Option C) should improve the eating characteristics of these meats. This should open new marketing opportunities for these meat processors and increase the live animal prices paid to producers. However, it is not likely to result in price parity between the traditional slaughter classes of animals and these older animals because of processing use differences.

Use of proteolytic enzymes on the muscle tissues of younger animals is not likely to have any beneficial effect on the quality of such meat, (Option B). Generally the tissues of these animals are sufficiently tender after customary preparation.

The duration of this proposed action will be indefinite if implemented as a final regulation.



b. Cost Impacts

(i) Industry Costs-The proposal would not cause any significant increase in industry costs since the use of proteolytic enzymes would be voluntary. Processors electing to use proteolytic enzymes would need to prepare new labels identifying the product as having been dipped or injected with an enzyme solution. Timing the label change with the need to procure an additional supply should minimize the cost.

(ii) Consumer Costs-Implementation of this proposal is not expected to have a significant effect on the retail prices of red or poultry meat products. The total supply of meat that might be affected by this proposal is about 6 percent of the pork, 7 percent of the lamb and mutton, 5 percent of the chicken and about one percent of the turkey. While food processors are likely to bid up the prices for these animals to replace the more expensive traditional meat and poultry supplies, it is unlikely the higher bid price would exceed the price for the such traditional supplies (table 1). Furthermore, the animal supply suitable for such processing may expand as a result of this action. An increase in such supplies would act to counter price increases.

c. Other Significant Economic Impacts

This proposal may increase competition between and among producers and processors of the traditional slaughter classes of animals and the classes affected by this proposal. This could lead to a small reduction in overall meat prices at the processor and wholesale levels.

This proposal could increase the farm income of producers of eggs, sheep and feeder pigs as a result of higher prices received from the sale of hens, turkeys, sheep, sows and boars.



d. Other Significant Social Effects

The proteolytic enzymes *aspergillus oryzae*, *aspergillus flavus* *oryzae* group, bromelin, ficin and papain currently are considered generally recognized as safe (GRAS) for human food by the Food and Drug Administration (FDA), and HEW. The GRAS status of these substances as tenderizing agents resulted from USDA prior-sanctions and from knowledge that they have been historically used as meat tenderizers. Recently, FDA announced their intention to conduct a safety evaluation of these substances to affirm their GRAS status. FSQS will advise FDA of the status of this proposed action and will consider their findings relative to continuation of GRAS status for the substance.

The proposed action would allow the application of proteolytic enzymes in the processing of all red meat and mature poultry, under prescribed moisture gain and labeling requirements. For uncooked product, moisture gain is limited to three (3) percent of the weight of the untreated meat. To the extent that this tenderization technique is allowed to be applied in situations where its efficacy is questionable, or quite minimal, consumer protection from economic adulteration may suffer.

e. Distribution of Effects

The effects of this proposal will be distributed nationally since all livestock, poultry, and egg producers would potentially benefit.





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